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RESULTS OF A LONGITUDINAL STUDY OF
AIRSICKNESS DURING NAVAL FLIGHT
OFFICER TRAINING: EXECUTIVE SUMMARY

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NAVAL AEROSPACE MEDICAL RESEARCH LABORATORY
PENSACOLA, FLORIDA

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EXECUTIVE SUMMARY: NFO AIRSICKNESS

INTRODUCTION

This paper is an executive summary of a longitudinal study conducted by the Naval Aerospace Medical Research Laboratory to determine the incidence and magnitude of airsickness experienced by Naval Flight Officers (NFOs) from the basic/primary level of training through the advanced/secondary level to the fleet readiness squadrons of the major NFO training pipelines. The primary objectives of the study were to determine the incidence of airsickness in each of the training squadrons, to identify differences in the motion stress exposure associated with the different pipelines that can affect decisions on the initial selection and assignment of NFO candidates, and to determine the frequency of students with persistent airsickness throughout training.

A secondary objective, was to establish predictive value of several short tests of motion reactivity administered one time prior to beginning flight training, in order to gain insight into the research avenues that must be followed in the future to develop and validate laboratory tests of motion reactivity that will have high predictive value in the identification of airsick susceptible individuals.

RESEARCH PROCEDURES

The basic function of the study was to acquire airsickness data on each participating NFO student for each hop he flew within a given training squadron as he progressed from the basic/primary phase in Training Squadron TEN (VT10) through one of four different advanced/secondary pipelines to type-specific FRS training. The four advanced training pipelines included Mather Air Force Base (MAFB) which leads to FRS training in the P-3 aircraft; Training Squadron EIGHTY SIX with either an Advanced Jet Navigation specialty (VT86-AJN) which leads to FRS training in A-6, EA-6, or S-3 aircraft or a Radar Intercept Officer specialty (VT86-RIO) which leads to FRS training in F-4 and F-14 aircraft; and the Airborne Tactical Data Systems (ATDS) pipeline which leads to E-2 training. In VT10, data describing the incidence and severity of airsickness that occurred on each hop comprising the squadron flight syllabus was derived from a questionnaire completed by each participating student and his flight instructor immediately following each flight. The same form of student and instructor questionnaire data were collected during advanced training in the VT86-AJN and VT86-RIO pipelines. For the MAFB pipeline and the FRS squadrons, airsickness data were derived from student ratings of their flight experiences.

TOTAL DATA BASE

As a result of the cooperation provided by the training command, airsickness data were collected on over 28,000 individual hops flown by approximately 800 students. These flight data

involved approximately 11,000 flights flown in VT10, 9,000 flights during advanced/secondary training and 8,000 flights during FRS training.

AIRSICKNESS INCIDENCE: OVER-ALL POPULATION

A high percentage of the NFO population experience airsickness difficulties during the course of their training. For example, during basic training in VT10, over 77 percent of the students reported being airsick one or more times. During advanced training in VT86-AJN and VT86-RIO corresponding figures were approximately 56 and 84 percent, respectively. Of those students that were followed throughout the entire course of their NFO training, fewer than 15 percent reported that they never experienced airsickness.

A summary listing of the incidence of airsickness, vomiting, and inflight performance degradation expressed as the percentage of the total flights flown in a given phase of training for different pipelines is presented in Table I. Of the 28,383 hops flown during the course of the study, over 13 percent of the flights resulted in airsickness, nearly 6 percent in vomiting, and over 7 percent in performance degradation.

TABLE I

Summary listing of the percent incidence of airsickness, vomiting, and performance degradation due to airsickness reported by the NFO population during the basic, advanced and FRS phases of flight training for different pipelines. Incidence is expressed as the percentage of the total hops flown in a given phase of training where the denoted airsickness event occurred.

Phase of Training	Number Students	Total Hops Flown	Airsickness Percent-hops	Vomiting Percent-hops	Perf.Degrad. Percent-hops
Basic Training					
VT10	796	10,759	19.4	9.2	12.7
Advanced Training					
VT86-AJN (Attack)	226	3,385	10.7	4.1	4.3
VT86-RIO (Fighter)	185	4,120	16.9	7.5	5.6
MAFB (P-3)	132	1,794	2.6	0.2	0.5
Subtotal	543	9,299	11.9	4.9	4.2
FRS Training					
Attack	120	3,269	9.2	3.9	4.1
Fighter	89	3,661	4.7	2.1	2.2
P-3	128	900	15.8	4.7	8.3
E-2	35	495	4.0	0.6	3.0
Subtotal	372	8,325	7.6	3.0	3.6
Total - All Phases	796	28,383	13.5	5.9	7.3

AIRSICKNESS AS A FUNCTION OF PHASE OF TRAINING

The highest incidence of airsickness occurred during basic/primary training in VT10 as would be expected. The nearly 20 percent incidence reported during this initial phase of training fell to approximately 12 percent during advanced training and decreased further to about 8 percent during FRS training. This decline reflects the general trend for aircrew to gain some degree of adaptation to motion stress as flight experience is gained and to a lesser extent to attrition of individuals with high airsickness indices.

PIPELINE DIFFERENCES

A decline in airsickness incidence as training progressed did not occur across all of the training pipelines. In the MAFB pipeline, few difficulties were encountered during advanced training with less than 3 percent of the hops involving airsickness. However, airsickness incidence rose to nearly 16 percent for this pipeline during the FRS phase of their training which occurred in the P-3 aircraft. For the other pipelines, airsickness incidence during FRS training never exceeded that encountered during advanced training. The NFOs assigned to MAFB fly an abbreviated flight syllabus during basic training; they encounter relatively few hops involving high motion stress at MAFB, but experience significant stress during FRS training. If the incidence of airsickness during FRS training in the P-3 aircraft is to be reduced, special attention should be given to the early identification of airsick susceptibles that might be assigned to this pipeline.

AIRSICKNESS SUSCEPTIBILITY: INDIVIDUALS WITH REPEATED AIRSICKNESS DIFFICULTIES

The contribution of the students who repeatedly experience airsickness during training to the overall incidence data is most significant. For example, of all the hops flown in VT10 where airsickness was reported to have occurred, fifty percent were due to less than 20 percent of the students. A relatively small proportion of the students account for a high percentage of the hops where airsickness occurs. To this end, a primary objective in the future development of laboratory-based measures of airsickness susceptibility must be directed at the early identification of these most susceptible NFOs.

LABORATORY TEST MEASURES

Several motion reactivity tests evaluated during the study showed significant correlations with inflight airsickness data. These included the Brief Vestibular Disorientation Test (BVDT) and the Visual/Vestibular Interaction Test (VVIT). Though these tests produced clear statistical differences between the highly nonsusceptible and highly susceptible components of the NFO population, the correlations were not of sufficient magnitude to allow the tests to be used as primary selection tools.

ATTRITIONS DUE TO AIRSICKNESS

In general, when students are removed from the flight program due to airsickness, the attrite is identified as a "Not Aeronautically Adaptable" (NAA) case. The study data showed little evidence that a significant number of students were removed from the flight program as a direct cause of airsickness. For example, over the study period, a total of 83 students attrited during the VT10 phase of training with only 5 of this total falling into the NAA category. However, the study did show a consistent difference between the mean airsickness incidence of students who graduated and students who attrited with the latter group having the higher incidence. Poor performance and low motivation resulting from airsickness may in some cases mask the actual number of attritions due to airsickness.

USE OF AIRSICKNESS MEDICATION

The student's questionnaire inquired about the use of airsickness medication. The resulting data indicated that only a relatively few hops (2 to 3 percent of the total hops flown) involved the use of such medication during basic and advanced training. Furthermore, a very small percentage, approximately 10 percent, of the total student population accounted for the medication usage. In general, the majority of the students who took airsickness medication used the drugs on only one or two flights. However, there were a few students in both basic and advanced training who used medication repeatedly, particularly late in the flight syllabus where certain hops were known to involve a high degree of motion stress. The use of such medication, during the mid-to-late phases of the flight syllabus should be discouraged since this practice tends to allow airsick susceptibles to continue in the flight program without the natural screening or attrition that might occur without medication.

STUDENT-VERSUS-INSTRUCTOR JUDGMENTS OF AIRSICKNESS INCIDENCE AND SEVERITY

As would be expected, the instructor judgments of the presence of airsickness on a given flight underestimated the incidence and severity of the problem as rated by the student. Similarly the students overestimated the amount of inflight performance degradation they suffered due to airsickness as compared to the judgments of their flight instructors. Even with these differences, the study data showed a strong and statistically significant correlation between the instructor and student judgments of airsickness thus allowing for the future development of validation criteria for new airsickness selection tests that are based upon instructor judgments rather than student inputs.

INSTRUCTOR'S IDENTIFICATION OF STUDENTS SUFFERING REPEATED AIR-SICKNESS DIFFICULTIES

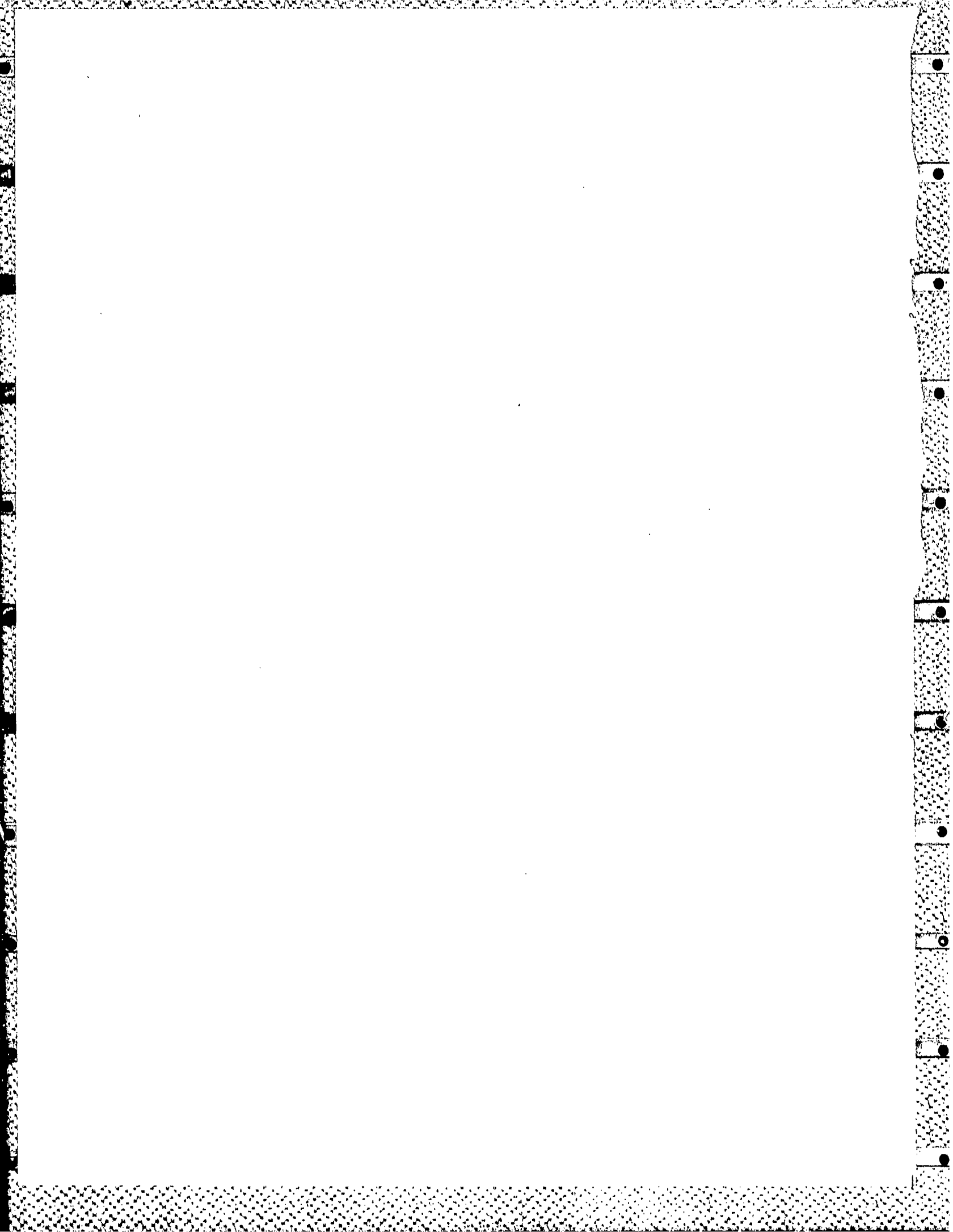
When a student repeatedly suffers airsickness during flight training, assistance may be gained by contacting the squadron Flight Surgeon. An instructor who observes these difficulties also has the same option to refer the student to a Flight Surgeon. The point here is that such referrals are optional and not mandatory. For example, in this study, several students reported suffering airsickness on over 50 percent of the hops they flew during basic training. The same occurred for several students receiving advanced training in VT86-AJN as well as in VT86-RIO. A grouping of the instructor data for one of the extreme cases in VT86-RIO showed that this individual had vomited on 13 different flights. Instructor judgments of extreme airsickness reactions should be centrally compiled so that students with repeated airsickness difficulties (and who chose not to report these difficulties to the Flight Surgeon) can be identified early in the training cycle.

AIRSICKNESS IN THE NFO POPULATION: COMPARISON WITH OTHER AIRCREW PERSONNEL

Airsickness problems have long existed in military aviation and are neither new nor unique to the NFO population. During and immediately following World War II, numerous field studies were conducted by the military which showed a high incidence of airsickness during various phases of flight training for both pilot and nonpilot aircrew groups. These studies showed that though the pilot and nonpilot groups were both at risk relative to airsickness, the latter group generally suffered the highest incidence rate. Though aircraft and flight duties have changed considerably since World War II the data of this study show that current nonpilot groups such as NFOs continue to be confronted with the same form and magnitude of the airsickness problem. In this respect, reduction of the incidence and severity of airsickness encountered during NFO training will be best accomplished by the development and validation of tests of airsickness susceptibility with high predictive value which can be used for the initial selection and assignment of individuals to the NFO training program.

RECOMMENDATIONS

1. Develop and validate tests of airsickness susceptibility for use in initial selection and assignment.
2. Develop and validate desensitization/adaptation methods to apply to motion susceptible individuals before assignment to training.
3. Develop and validate desensitization/adaptation methods to apply to fleet personnel with motion susceptibility problems, to eliminate attrition of this high cost group.



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